

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: Warren M. Ewert, et al.  
Serial Number 10/800,471  
Filed March 15, 2004  
Examiner Ellen M. McAvoy  
Group Art Unit 1797  
For: PROCESS TO DECREASE OR ELIMINATE CORROSION FROM  
THE DECOMPOSITION OF HALIDE CONTAINING OLEFIN  
CATALYST

**APPEAL BRIEF****MAIL STOP: APPEAL BRIEF - PATENTS**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**CERTIFICATE OF EFS-WEB FILING**

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*Edith Shek*  
Edith Shek

Sir:

This Appeal Brief is filed in support of the appeal in the herein referenced patent application and filed pursuant the Notice of Appeal filed on August 19, 2009, for which the period to file the Appeal Brief was October 19, 2009. Appellants have filed a request for a five-month extension thereby extending the date for filing the Appeal Brief to March 19, 2010. Appellants authorize all other required fees under 37 C.F.R. § 1.17 to be deducted from Deposit Account 50-1515, Conley Rose, P.C. of Texas.

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**I. REAL PARTY IN INTEREST**

The real party in interest in the instant application is the following party: Chevron Phillips Chemical Company, LP.

**II. RELATED APPEALS AND INTERFERENCES**

None

**III. STATUS OF CLAIMS**

**A. *Total Number of Claims in the Application***

Claims in the application: 1-65

**B. *Status of All Claims in the Application***

1. Claims canceled: 2, 7-9, 14, 19, 32-34, 38, 40, and 47.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65.
4. Claims allowed: None.
5. Claims rejected: 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65.
6. Claims objected to: None
7. Claims neither rejected nor allowed: None.

**C. *Claims on Appeal***

1. Claims on appeal: 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65.

**IV. STATUS OF AMENDMENTS**

No amendments were filed after the May 19, 2009 Final Office Action.

**V. SUMMARY OF THE CLAIMED SUBJECT MATTER**

The present section provides a concise explanation of the subject matter defined in each independent claim involved in the appeal, referring to the specification by page and line number. Each feature of the claims is identified with a corresponding reference to the specification where applicable. Citation to passages in the specification for each claim feature does not imply that the limitations of the specification should be read into the corresponding claim feature.

**A. *Highlights of the Disclosure***

Olefins may be oligomerized using a number of different catalysts or catalyst systems. Some olefin oligomerization catalysts or catalyst systems contain a halide-containing compound (e.g. a metal halide or an alkyl metal halide). Typically, the olefin oligomerization is performed by contacting the olefin and olefin oligomerization catalyst system in a reactor. After oligomerization, the reactor effluent is treated to kill and/or deactivate the catalyst system and the olefin oligomerization product recovered by distillation.

The present application discloses that under particular olefin oligomerization product recovery conditions an alcohol deactivated halide-containing olefin oligomerization catalyst system will decompose. For example, the use of excessive heat when separating the alcohol deactivated halide-containing olefin oligomerization catalyst system from the olefin oligomerization product (and/or byproducts) via distillation will lead to alcohol deactivated halide-containing olefin oligomerization catalyst system decomposition. The decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system produces an acidic gas which in the long term leads to corrosion of the process equipment. It has been unexpectedly discovered that passing material through the reboiler of a distillation at a lower

temperatures (e.g. less than about 190 °C) limits the decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system.

The present application also discloses that the presence of water in the alcohol utilized to deactivate the halide-containing olefin oligomerization catalyst system will exacerbate alcohol deactivated halide-containing olefin oligomerization catalyst system decomposition by lowering the temperature at which the alcohol deactivated halide-containing olefin oligomerization catalyst decomposes. The present application also discloses that the minimization of water in the alcohol reduces or eliminates the lowering of the temperature at which the deactivated halide-containing olefin oligomerization catalyst system substantially decomposes.

The processes disclosed within the present application reduce or inhibit the decomposition of the alcohol deactivated halide-containing olefin oligomerization catalyst system and thus reduce the formation of halide gas during the recovery of the olefin oligomerization product. A benefit of the reduction halide gas formation is reduced corrosion of the olefin oligomerization product recovery equipment and an increase in the useful lifetime of the equipment. Since olefin production plants are designed for decades of operation, the solutions represented by the pending claims would significantly impact the economics of an olefin oligomerization plant via extending the useful lifetime of the olefin oligomerization recovery equipment.

#### ***B. Concise Explanation of Claims Under Appeal***

Claim 1 recites a process to deactivate a halide-containing oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product (*see, e.g.*, Application at page 2, lines 21-23; page 4, lines 10-13; page 7, lines 1-3; original claim 1) comprising the steps of: a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s),

catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream (*see, e.g.*, Application at page 2, lines 24-26; page 13, lines 12-15; original claim 1) thereby deactivating the catalyst system (*see, e.g.*, Application at page 14, lines 1-2); and b) separating the intermediate stream of step (a) into at least one product stream comprising the olefin oligomerization product and at least one heavies stream (*see, e.g.*, Application at page 4, lines 12-14; original claim 2); wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C (*see, e.g.*, Application at page 14, lines 16-17; page 14, lines 25-27; original claim 9), and wherein the catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound (*see, e.g.*, Application at page 2, lines 26-28; page 7, lines 4-5; page 9, lines 12-13; page 9, lines 18-21; original claim 1) and wherein the alcohol is added in an amount to effect a mole alcohol to mole aluminum ratio between about 2.5 and about 1.5 (*see, e.g.*, Application at page 2, lines 28-29; page 14, lines 10-11; original claim 1).

Claim 18 recites a process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product (*see, e.g.*, Application at page 2, lines 21-23; page 4, lines 10-13; page 7, lines 1-3; original claim 18) comprising the steps of: a) contacting an alcohol with an adsorbent capable of adsorbing water (*see, e.g.*, Application at page 16, lines 16-17); b) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with the alcohol (*see, e.g.*, Application at page 2, lines 24-26; page 13, lines 12-15; original claim 18) thereby deactivating the catalyst system (*see, e.g.*, Application at page 14, lines 1-2); and c) separating the intermediate stream of step (b) into at least one olefin oligomerization product stream and at least

one heavies stream (*see, e.g.*, Application at page 4, lines 12-14; original claim 19); wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C (*see, e.g.*, Application at page 14, lines 16-17; page 14, lines 25-27; original claim 9), and wherein said catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound (*see, e.g.*, Application at page 2, lines 26-28; page 7, lines 4-5; page 9, lines 12-13; page 9, lines 18-21; original claim 1) and wherein the alcohol is soluble in any portion of the reactor effluent stream (*see, e.g.*, Application at page 2, lines 28-29; page 14, lines 10-11).

Claim 37 recites a process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product (*see, e.g.*, Application at page 2, lines 21-23; page 4, lines 10-13; page 7, lines 1-3; original claim 37) comprising the steps of: a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s) and catalyst system with an alcohol that is soluble in any portion of the reactor effluent stream (*see, e.g.*, Application at page 2, lines 24-26; page 13, lines 12-15; original claim 37) thereby deactivating the catalyst system (*see, e.g.*, Application at page 14, lines 1-2); and b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream (*see, e.g.*, Application at page 14, lines 15-16; page 14, lines 18-20; page 15, lines 6-9; original claim 37); wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190°C (*see, e.g.*, Application at page 14, lines 16-17; page 14, lines 25-27; and original claim 38).

Claim 57 a process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an

olefin oligomerization product (*see, e.g.*, Application at page 2, lines 21-23; page 4, lines 10-13; page 7, lines 1-3; original claim 57) comprising the steps of: a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream (*see, e.g.*, Application at page 2, lines 24-26; page 13, lines 12-15; original claim 57) thereby deactivating the catalyst system (*see, e.g.*, Application at page 14, lines 1-2); and b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream and at least one heavies stream (*see, e.g.*, Application at page 4, lines 12-14; original claim 2); wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C (*see, e.g.*, Application at page 14, lines 16-17; page 14, lines 25-27; original claim 9), and wherein the catalyst system comprises active metal alkyl units (*see, e.g.*, Application at paragraph 10 lines 1-4; and original claim 57), and wherein the alcohol is present in an amount greater than 0.1 and less than about 1.8 equivalents per equivalent of active metal alkyl units (*see, e.g.*, Application at page 3, lines 15-17; and original claim 57).

**VI. GROUND FOR REJECTION TO BE REVIEWED ON APPEAL**

1. Whether the Final Office Action presented a prima facie case of obviousness under 35 U.S.C. 103(a) over U.S. Patent 5,689,028 (Lashier), U.S. Patent 5,750,816 (Araki), or U.S. Patent 6,380,451 (Kreischer) as to claims 1, 18, 37, and 57.
2. Whether claims 1, 18, 37, and 57 are unpatentable over Lashier, Araki, or Kreischer under 35 U.S.C. 103(a). Specifically, does Lashier, Araki, or Kreischer teach all the limitations of the claims?
3. Whether claim 18 is unpatentable over Lashier. Specifically, does Lashier inherently teach contacting the alcohol with an absorbent?

## VII. ARGUMENT

### A. *Rejection of Claims*

Claims 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65 are pending in the present application and are listed in the Claims Appendix. In the Final Office Action dated May 19, 2009 (hereafter the “Final Office Action”), claims 1, 3-6, 10-13, 15-18, 20-31, 35-37, 39, 41-46, and 48-65 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lashier et al., U.S. Patent 5,689,028 (hereafter “Lashier”), Araki et al., U.S. Patent 5,750,816 (hereafter “Araki”), and Kreischer et al., U.S. Patent 6,380,451 (hereafter “Kreischer”), considered separately.

Regarding Lashier, the Final Office Action cites Lashier as disclosing “a process to regulate olefin production by deactivating the catalyst system which comprises the sequential steps of contacting a reactor effluent stream with an alcohol, removing and recovering any desired olefin product(s), adding an aqueous base to the reactor stream effluent, removing a solid product from the reactor stream effluent, separating organic and aqueous phases, adding an acid to the aqueous phase and recovering the precipitate,” that “Lashier teaches catalyst systems, reactants and reaction conditions, and suitable alcohol compounds which may be added to the reactor effluent,” and that “[no] water content is the alcohol component is disclosed so the examiner is of the position that water-free alcohols are used.” As such the Final Office Action “maintains the position that the process of Lashier appears to be indistinguishable from the claimed processes.” *See* Office Action; paragraph bridging page 2 and 3.

Regarding Araki, the Office Action cites Araki as disclosing “a process for preparing alpha-olefin oligomers using a chromium-based catalyst system comprising (a) a chromium compound, (b) at least one nitrogen-containing compound, and (c) an alkylaluminum compound,” and that “Araki teaches that the reaction effluent stream may then be supplied into a

product distillation tower to recover the produced alpha-olefin oligomers as a distillate while concentrating the by-product polymers (i.e., heavies) and catalyst components which are recovered as a bottoms product.” As such the Final Office Action “maintains the position that the process of Lashier appears to be indistinguishable from the claimed processes.” *See* Final Office Action; paragraph bridging page 4 and 5.

Regarding Kreischer, the Final Office Action cites Kreischer as disclosing “a process of cleaning an oligomerization reactor after making a higher olefin in the reactor,” “[s]uitable catalyst systems used in such a reaction include the combination of a chromium source, a pyrrole-containing compound and one or metal alkyls such as aluminum alkyl compounds,” “interior surface of the reactor is then contacted with an alcohol under conditions effective to remove at least a substantial amount of the catalyst residue from the interior surface of the reactor,” and “that after the catalyst has been deactivated, the olefin product(s) are removed from the reactor effluent stream” using any removal process “although distillation is preferred for ease of use.” As such the Final Office Action “maintains the position that the process of Kreischer appears to be indistinguishable from the claimed processes.” *See* Final Office Action page 7, 1<sup>st</sup> paragraph.

To support the position that the processes of Lashier, Araki, and Kreischer appear to be indistinguishable from independent claims 1, 18, 37, and 57, the Final Office Action further stated:

- that Lashier, Araki, and Kreischer teach “after the catalyst deactivation, the olefin products can be removed by any removal process, preferably distillation,” “reaction conditions which can affect the above-mentioned steps are useful, and removal of the olefin product(s) by distillation was an above mentioned step,” and “[r]eaction

conditions are assumed to include temperature and pressure.” *See* Final Office Action page 3, lines 17-21, page 5, line 22, to page 6, line 4, and page 8, lines 5-9.

- that while Lashier, Araki, and Kreischer “[do] not teach the temperature of a reboiler in the separation of the olefin(s) product by distillation, the prior art teaches that any reaction conditions which can affect the above-mentioned steps, including separation of the same product(s) by distillation, can be used” and that the position is maintained “that the skilled artisan would know what reboiler temperatures could reasonably be used to effectively run the olefin(s) separation process by distillation.” *See* Final Office Action page 4, lines 1-6, page 6, lines 7-12, and page 8, lines 12-17.
- that since the processes of Lashier, Araki, and Kreischer “uses the same catalyst system as the claims, the same method of deactivation of the catalyst system by the same alcohols of the claims, and the same product recovery step of distillation as the claims, the reboiler temperature of less than 190°C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught.” *See* Final Office Action page 4, lines 6-11, page 6, lines 12-16, and page 8, lines 17-22

As such the Final Office Action, in light of Lashier, Araki, and Kreischer, maintained “the position that the fact that applicants have discovered that at reboiler temperatures higher than 190°C the deactivated catalyst system decomposition begins to increase does NOT result in the patentability of a known process” because “where the general conditions of a claim are disclosed in the prior art it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 CCPA 1955.”

**B. The Final Office Action Fails to Present a *prima facie* Case of Obviousness under 35 U.S.C. 103(a) over Lashier, Araki, or Kreischer as to claims 1, 18, 37, and 57**

Independent claims 1, 18, 37, and 57 read:

1. A process to deactivate a **halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product** comprising the steps of:
  - a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and
  - b) separating the intermediate stream of step (a) into at least one product stream comprising the olefin oligomerization product and at least one heavies stream;  
**wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and wherein the catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound and wherein the alcohol is added in an amount to effect a mole alcohol to mole aluminum ratio between about 2.5 and about 1.5.**
18. A process to deactivate a **halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product** comprising the steps of:
  - a) contacting an alcohol with an adsorbent capable of adsorbing water;
  - b) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with the alcohol thereby deactivating the catalyst system; and
  - c) separating the intermediate stream of step (b) into at least one olefin oligomerization product stream and at least one heavies stream;  
**wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and wherein said catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound and wherein the alcohol is soluble in any portion of the reactor effluent stream.**
37. A process to deactivate a **halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product** comprising the steps of:
  - a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s) and catalyst

- system with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and
- b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream;  
wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190°C.
57. A process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product comprising the steps of:
- a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and
  - b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream and at least one heavies stream;  
wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and  
wherein the catalyst system comprises active metal alkyl units, and  
wherein the alcohol is present in an amount greater than 0.1 and less than about 1.8 equivalents per equivalent of active metal alkyl units.

Each of the instant independent claims provide for a “process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product” that includes “a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” The Final Office Action admits that Lashier, Araki, and Kreischer “does not teach the temperature of a reboiler in the separation of the olefin(s) product by distillation . . . .” *See* Final Office Action at 4, 6, and 8. Consequently, the Final Office Action concedes that none of these references contain all of the elements of the claimed invention. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966).

Cognizant of this fatal shortcoming within Lashier, Araki, and Kreischer, the Final Office Action attempts to overcome the acknowledged missing element by referencing broad, boiler-

plate language directed toward “reaction” conditions by crafting a conclusory, inherency-type argument equating “reaction” conditions to the “recovery” process step. *See* Final Office Action at 4, 6, and 8 (The Examiner states, “the prior art teaches that any reaction conditions which can affect the above-mentioned steps . . . can be used” -- presumably referencing Lashier at col. 7, lines 16-17 because Araki and Kreischer are silent in this regard.). Even if reaction conditions could be read upon product recovery condition, without admitting that such would proper, the final Office Action still fails to present a *prima facie* case of obviousness. Beyond the mere equating of reaction conditions with product recovery conditions, the Final Office Action held that:

- “reaction conditions are assumed to include temperature and pressure” and
- “any reaction condition which can affect the above mentioned step, include separation of the same product(s) by distillation, can be used.”

Appellants respectfully submit, that in this particular instance, these holdings cannot maintain a *prima facie* case of obviousness.

### **1. Reboiler Temperature is a Result Effective Variable**

A Federal court has recognized that claims reciting an optimized result-effective variable may be patentable over a broadly disclosed concept. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) “The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.”

Lashier, Araki, and Kreischer each disclose that distillation may be utilized to separate an oligomerization product from deactivated oligomerization catalyst system. However, Lashier,

Araki, and Kreischer fail to disclose any range of temperature that one should use in a distillation. In contrast, independent claims 1, 18, 37, and 57 each recite that a specific distillation where “material passed through the reboiler is maintained below about 190 °C” and the patent application shows that the temperature at which material is passed through the reboiler is a result-effective variable relating to the ability to “inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product.”

In relation to independent claim 1 and 18, Appellants direct attention to page 21, lines 1-20 of the present patent application. This section of the patent application provides a discussion of the results in the evaluation of the temperature sensitivity of a halide containing selective 1-hexene catalyst system comprising a chromium source, a pyrrole-containing compound, and an alkylaluminum compound that had been deactivated with 2-ethylhexanol. Specifically, page 21, lines 14-18, of the patent application paragraph recites:

The assessment of temperature sensitivity was done by examining the 14 hours on stream sample for deactivated catalyst decomposition by the formation of octenes, the presence of alcohol and the appearance or disappearance of 2,5-dimethylpyrrole at different temperatures. The decomposition temperature was observed to occur just above 190° C (374° F) at all of the alcohol deactivation levels.

Consequently, it was found that decomposition of the alcohol deactivated catalyst system was dependent upon temperature and that the effect was observed to occur just above 190 °C and as such the temperature at which material containing an alcohol deactivated halide-containing olefin oligomerization catalyst system is passed through the reboiler of a distillation is a result-effective variable.

In relation to independent claims 1, 18, 37, and 57, additional evaluations of the stability of an alcohol deactivated halide-containing olefin oligomerization catalyst system focused on diethylaluminum chloride (the halide-containing component of the exemplary olefin

oligomerization catalyst system) that had been treated with 2-ethyl-1-hexanol. These experiments and results are discussed on page 25, line 10, to page 30, line 2, the patent application and are shown graphically in Figures 1 and 3 of the patent application. Figure 1 (reproduced below), shows the effect temperature has on the 2-ethyl-1-hexanol deactivated diethylaluminum chloride via the differential in the amount of alcohol detected (which is a measure of catalyst decomposition) in the overhead fraction of a distillation. As can be seen, the amount of additional alcohol begins to increase substantially at temperatures greater than 190 °C.

FIG. 1

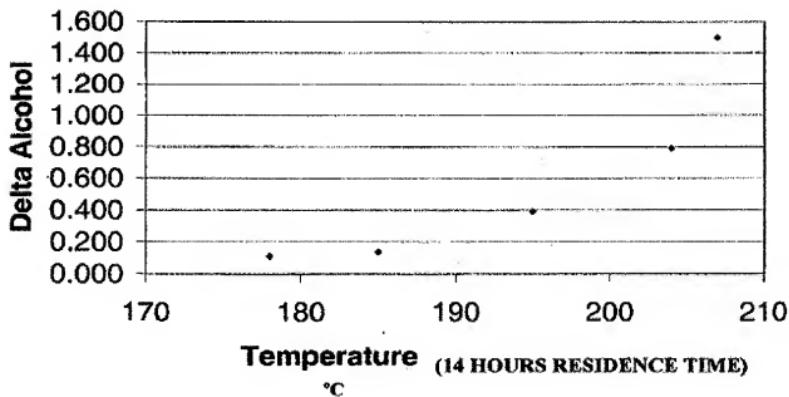
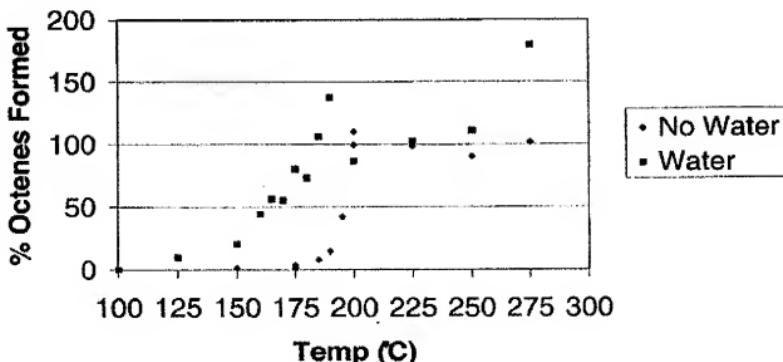


Figure 3 (reproduced on the next page), shows the effect temperature has on 2-ethyl-1-hexanol deactivated diethylaluminum chloride via the percentage of octenes formed in the absence of water (diamond shaped data points). As can be seen, the amount of octenes formed increase substantially at temperatures greater than 190 °C.

FIG. 3



Figures 1 and 3 clearly show that the temperature at which material is maintained (as in a distillation tower reboiler) is a result-effective variable relating to inhibiting or limiting "the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product." This point was not appreciated by Lashier's, Araki's, and Kreischer's general disclosure of recovering the oligomerization product by distillation. Since, the temperature at which material passes through the reboiler temperature is a result-effective variable relating to relating to the ability to "inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product" was not appreciated by Lashier, Araki, or Kreischer, the temperature at which material is passed through a reboiler of a distillation is patentable over a previous broadly disclosed product recovery of Lashier, Araki, or Kreischer. As such, independent claim 1, 18, 37, and 57 are patentable over Lashier, Araki, or Kreischer.

**2. A Temperature of Below About 190 °C for Which The Material Passed Through the Reboiler is a Critical Value.**

The Federal Circuit has recognized that claims reciting a specific variation of a previously disclosed broad concept may be patentable upon a showing of criticality. *In re Woodruff*, 919

F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) assert that “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.”

As presented in the previous section, the pending patent application provides experiments and data clearly showing that the processes to “deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product” of independent claims 1, 18, 37, and 57 may not use just any temperature for passing material through the reboiler. In fact, the evidence presented in the patent application (as discussed in the previous section) shows that the temperature of below about 190 °C is a critical temperature at which material passed through the reboiler must be maintained. As such, the showing of critically effectively rebuts the Office Action arguments of obviousness of independent claims 1, 18, 37, and 57 in light of Lashier, Araki, and Kreischer, considered separately.

**C. Lashier, Araki, and Kreischer, Considered Separately, Fail to Teach a Temperature at Which Material is Passed Through a Distillation Reboiler**

In *Graham v. John Deere Co. of Kansas City*, the United States Supreme Court, provided that an obviousness determination begins with a finding that “**the prior art as a whole in one form or another contains all**” of the elements of the claimed invention. See *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966). The Appellants respectfully submit that Lashier, Araki, and Kreischer, considered separately, do not disclose all the elements of independent claims 1, 18, 37, and 57.

There are multiple reasons why Lashier, Araki, and Kreischer, considered separately, cannot be read to disclose all the elements of the instant claims and thus, cannot support obviousness rejections of the instant claims.

First, reaction conditions cannot be read to disclose product recovery conditions.

Second, reliance on what one of ordinary skill in the art might know about distillation recovery temperatures is negated by Araki's teaching away of the instantly element of separation that comprises a "distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C."

Third, the Final Office Action relies on a logical fallacy in rejecting the instant claims. Specifically, the Final Office Action reliance upon an "affirming the consequence" argument results in the rejections being based on improper *per se* obviousness.

#### ***1. Reaction Conditions cannot be Read to Disclose Product Recovery Conditions***

The Final Office Action has admitted that Lashier, Araki, and Kreischer do not teach the element that "material passed through the reboiler is maintained below about 190 °C." To overcome this deficiency, the Office Action attempts to cure deficiency of teaching a reboiler temperature by asserting that:

- Lashier, Araki, and Kreischer teach that "after catalyst deactivation, the olefin product can be removed by any removal process, preferably distillation."
- Lashier, Araki, and Kreischer teach that "any reaction conditions which can affect the above mentioned steps are useful, and removal of the olefin products(s) by distillation was an above mentioned step."
- "reaction conditions are assumed to include temperature and pressure."

- “any reaction condition which can affect the above mentioned step, include separation of the same product(s) by distillation, can be used.”

Appellants respectfully submit that the Final Office Action has improperly equated reaction condition with product recovery conditions.

First, Lashier, Araki, and Kreischer make a clear distinction between reaction methods (the conditions utilized to produce the olefin oligomerization product) and olefin oligomerization product recover methods (the conditions utilized to separate and purify the olefin oligomerization product). Lashier and Kreischer clearly separates their respective overall processes into at least reaction conditions (column 4, line 64, bridging column 5, line 43 and column 7, line 40, bridging column 8, line 67, respectively), catalyst deactivation (column 5, line 53, bridging column 6, line 21 and column 9, line 1-62, respectively), and product recovery (column 9, lines 22-25, and column 9, line 63, bridging column 10, line 8, respectively) among other steps (e.g. catalyst preparation, waste product stream treatment, among others). Further, Araki clearly separates the discussion of reaction conditions (column 6, line 51, bridging column 9, line 15) and product recovery conditions (column 9, line 16 bridging column 14, line 45). Consequently, it is clear that Lashier, Araki, and Kreischer viewed the reaction (and the associated conditions) and product recovery (and the associated conditions) as separate and distinct aspect of their processes. Consequently, without direct evidence that Lashier, Araki, and Kreischer intended reaction conditions to read upon product recovery conditions, a finding equating reaction conditions with product recovery conditions cannot be maintained in light of their separate teachings within Lashier, Araki, and Kreischer.

Second, one of ordinary skill in the art recognizes that reactions conditions, such as those for the described oligomerization reaction, and the conditions for product recovery involve

totally different considerations. For example, in the trimerization of ethylene to 1-hexene, the oligomerization ethylene pressures are kept high to provide adequate concentration of ethylene for the reaction while distillation equipment pressure is usually maintained around atmospheric pressure (or lower) to avoid additional equipment cost to maintain pressures in excess of atmospheric temperature on the distillation equipment. Additionally, one of ordinary skill in the art recognizes that increasing distillation pressure increases the distillation temperature and temperatures of material passed through the reboiler. This would in effect lead to increasing the temperature of the material in the reboiler making it more difficult to pass material through the reboiler at a temperature less than about 190 °C as recited in independent claims 1, 18, 37, and 57. In relation to temperature, one of ordinary skill in the art recognizes that reaction temperatures are dictated by catalyst activity and stability, among other considerations, while distillation temperatures are dictated by the boiling points of the materials being separated. For these reasons, reaction conditions cannot be applied to product recovery/distillation conditions and statements attempting to read reaction conditions upon recovery/distillation conditions.

Without the ability to read reaction condition upon product recovery conditions, Lashier, Araki, and Kreischer do not teach a separation comprising “a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” Consequently, Lashier, Araki, and Kreischer, do not teach at least one limitation of independent claims 1, 18, 37, and 57 and these claim are patentable over Lashier, Araki, and Kreischer, considered separately. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966).

**2. Araki's Teaching Away from the Claim Feature of "Material Passed Through the Reboiler is Maintained Below About 190 °C" Prohibits The Conclusion That One Of Ordinary Skill In The Art Would Have Known Of The Instantly Claimed Methods**

The Federal Circuit has on several occasions has addressed the issue of cited references teaching away from a claimed feature. For example *In re Haruna*, 249 F.3d 1327, 58USPQ2d 1517 (Fed. Cir. 2001) provided that a ‘prima facie case of obviousness can be rebutted if the applicant...can show that the art in any material respect ‘taught away’ from the claimed invention...A reference may be said to teach away when a person of ordinary skill, upon reading the reference...would be led in a direction divergent from the path that was taken by the applicant.’’ See also *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). Additionally, the Federal Circuit provided in *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983) that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. Additionally, in *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004) the Federal Circuit provided that an “Applicant can rebut a presumption of obviousness based on a claimed invention that falls within a prior art range by showing ‘(1) [t]hat the prior art taught away from the claimed invention...or (2) that there are new and unexpected results relative to the prior art.’’’ See *supra*, Sections VII, B, 1 & 2.

Appellants respectfully submit that Araki teaches away the claim feature of independent claims 1, 18, 37 and 57 reciting that “material passed through the reboiler is maintained below about 190 °C.” In Examples 1 (see Table 1), 3, and 10, Araki utilizes heater/heating pipe temperatures of 230 °C, 200°C, and 200 °C, respectively. These heater/heating pipe temperatures would lead to material passed through the reboiler exceeding a temperature of

about 190 °C as recited in independent claims 1, 18, 37, and 57. All other Araki examples either refer, ultimately, to Examples 1, 3, and 10 (Example 2, Comparative Example 1, Examples 4-9, Examples 11-16, and Comparative Example 2) or provide no indication of what heater/heating pipe temperature was used (Example 17). Additionally, at no other place in the specification does Araki indicate temperatures at which material should be passed through a reboiler or what heater/heating pipe temperature should be used. Therefore, Araki teaches conditions which would lead a person with ordinary skill in that art to pass material through a reboiler at a temperature greater than the about 190 °C stipulated by independent claims 1, 18, 37, and 57. Consequently, Araki teaches away from the feature of using a separation comprising “a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C” in the recovery of a olefin oligomerization product when the stream contains an alcohol deactivated halide-containing olefin oligomerization catalyst system and the presumption of independent claims 1, 18, 37, and 57 being obviousness in light of Araki is effectively rebutted.

In relation to Lashier and Kreischer, even if the Final Office Action statements that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and that a “reboiler temperature of less than 190 °C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught” could be held to represent a valid argument, without admitting that such would be proper, any teaching in the art that provides specific evidence contradicting these statements would effectively rebut the argument. Specifically, since Lashier, Araki, and Lashier represent persons having ordinary skill in the art, a finding that any one of these references did not know what temperature at which to pass material through the reboiler

alone or in combination with a failure to mention corrosion would rebut the presumption that the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation.

Appellants respectfully submit that the statement that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” is not supported by the facts gleaned from Araki. As previously presented, Araki utilized conditions which would lead to material passing through the reboiler at a temperature greater than about 190 °C. Specifically, Araki utilized heater/heating pipe temperatures of 230 °C, 200 °C, and 200 °C, within Examples 1, 3, and 10, respectively. Additionally, Araki provides no teaching of material passing through the reboiler at a temperature less than about 190 °C. These facts alone indicates that Araki, as one having ordinary skill in the art, did not know “what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and avoid decomposition of a deactivated halide-containing olefin oligomerization catalyst system and rebuts any presumption that Lashier and Kreischer (who also did not provide any guidance regarding the temperature at which material should be passed through the reboiler) would “know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product.”

Appellants also respectfully submit that Araki made no mention the decomposition the deactivated halogen-containing olefin oligomerization catalyst system or corrosion within any of the examples (a fact admitted by the Final Office Action) while using conditions Appellants disclosure shows should lead to decomposition. Therefore, Araki’s non-teaching of deactivate

halogen-containing olefin oligomerization catalyst system or corrosion must be due to some other reason than using a separation comprising “a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C.” For example, Araki may not have monitored catalyst system decomposition or process system equipment corrosion, or Araki may not have been aware that the deactivated halide containing olefin oligomerization catalyst system would decompose at the distillation condition employed in Examples 1, 3, and 10. Consequently, Araki, as a person with ordinary skill in the art did not know “what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” to “inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product” and the Araki’s non-teaching of catalyst system decomposition or process system equipment corrosion rebuts a presumption that a failure to mention corrosion is proof that material passed through a reboiler was maintained at less than 190 as recited in independent claims 1, 18, 37, and 57.

Since it is documented that one person of ordinary skill in the art does not know “what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” to “inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product,” Lashier and Kreischer, which have even less disclosure in regard to the temperature utilized during the recovery of the olefin oligomerization product via distillation than Araki cannot be held to know “what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” to “inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product.” Consequently, without specific evidence that one having ordinary skill the art utilized a temperature for passing material through the reboiler of less than about 190

°C, including Lashier or Kreischer, independent claims 1, 18, 37, and 57 cannot be held to be obvious on the grounds that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” alone or in combination with a assertion that a “reboiler temperature of less than 190 °C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught”.

Based on the foregoing, Lashier, Araki, and Kreischer, considered separately, cannot be read to disclose all the elements of the instant claims. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966).

**3. *The Assertion that a “Reboiler Temperature of Less than 190 °C Was Most Likely Used” Is Based Upon an Invalid Logical Argument Results in an Improper Per Se Obviousness Determination***

As previously presented, Lashier, Araki, and Kreischer, considered separately do not teach the feature of “material passed through the reboiler [of a distillation comprising a reboiler] is maintained below about 190 °C.” The Final Office Action attempts to overcome this deficiency by asserting that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation” and the further assertion that a “reboiler temperature of less than 190 °C most likely was also used since no decomposition of the catalyst system and no corrosion of the process equipment was taught.”

These two statements represent an example of the formal logical fallacy termed “affirming the consequence” or sometimes called “converse error.” This formal logical fallacy takes the form of: If A, then B. B. Therefore A. This logical form can be false even if the first statements are true because the first statement does not assert that A is the only condition by which B can be achieved. For example, the conclusion of the argument “If a person has a cold,

then they sneeze. She sneezed. Therefore, she must have a cold." is false because there are other reasons why she may have sneezed (e.g. she may have allergies).

In this instance the Office Action has taken statements (within the patent application and made by the Applicants) that decomposition of the deactivated halide-containing olefin oligomerization catalyst system can lead to the formation of halide gas during the recovery of the olefin oligomerization product and that the halide gas can lead to corrosion of the olefin oligomerization product recovery equipment and **assumed that the only reason** that Lashier, Araki, and Kreischer would not have mentioned corrosion is because the material they passed through the reboiler was kept below about 190 °C. This assumption is false on at least three bases.

First, Lashier, Araki, and Kreischer may not have mentioned corrosion because they were not aware that an alcohol deactivated halide-containing olefin oligomerization catalyst system would decompose at recovery/distillation reboiler temperatures in excess of about 190 °C and thus did not perform any tests to monitor the decomposition of a alcohol deactivated halide-containing olefin oligomerization catalyst system or corrosion to indicate the decomposition. Second, Lashier, Araki, and Kreischer may not have observed corrosion because corrosion is cumulative and long term issue and the time scale for the experiments of Lashier, Araki, or Kreischer were not sufficient time to observe corrosion. Third, Lashier, Araki, and Kreischer may have implemented other methods to limit or inhibit corrosion.

Consequently, there exists more than one reasonable reason why Lashier, Araki, and Kreischer may not have mentioned decomposition of the catalyst system and/or corrosion of the process equipment. As such, and without specific evidence that the material passed through the reboiler was maintained at below about 190 °C, the assertion that "the skilled artisan would know

what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation" coupled with the assertion that a "reboiler temperature of less than 190 °C most likely was also used [by Lashier, Araki, or Kreischer] since no decomposition of the catalyst system and no corrosion of the process equipment was taught" cannot support a finding of obviousness in light of Lashier, Araki, or Kreischer.

Additionally based upon the foregoing, the assertion "the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation" must stand alone. Appellants respectfully submit that this statement provides no facts or articulated reason to support the legal conclusions of obviousness without any additional valid reasoning. *See KSR Int'l Co. v. Teleflex, Inc.*, 82 USPQ2d 1385, 1397 (2007) (emphasis added). ("Rejections on obviousness grounds **cannot be sustained by mere conclusory statements**; instead, there must be some **articulated reasoning with some rational underpinning** to support the legal conclusion of obviousness"). Further, this Office Action assertion seems to invoke a rule of per se obviousness. *In re Ochiai* 71 F.3d 1565, 1572, 37 USPQ2d 1127, 1133 (Fed. Cir. 1995) the Federal Circuit stated:

[t]he use of per se rules, while undoubtedly less laborious than a searching comparison of the claimed invention--including all its limitations--with the teachings of the prior art, flouts section 103 and the fundamental case law applying it.

and went on to admonish that "reliance on per se rules of obviousness is legally incorrect and must cease."

Consequently, a reliance upon the assertion that "the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation," considered alone, would run contrary to Federal Circuit case law. As such, Independent claims 1, 18, 37, and 57 cannot be found obvious in view of Lashier, Araki, and

Kreischer, considered separately, on the basis of the statement that “the skilled artisan would know what reboiler temperatures could be reasonably used to effectively run the olefin(s) separation process by distillation.”

Based on the foregoing, Lashier, Araki, and Kreischer, considered separately, cannot be read to disclose all the elements of the instant claims. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966).

**D. Presumption that Water-Free Alcohols Are Used is a Holding of Inherency Based Upon Possibilities**

In relation to the independent claim 18 feature reciting “contacting an alcohol with an adsorbent capable of adsorbing water,” the Final Office Action has held that “[no] water content is the alcohol component is disclosed so the examiner is of the position that water-free alcohols are used.” Appellants respectfully submit that this Office Action conclusion represents a statement that Lashier inherently teaches using water-free alcohols. Federal Court has held that “[t]o establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'”

The statement “[no] water content is the alcohol component is disclosed so the examiner is of the position that water-free alcohols are used” recognizes that there are two possibilities (either the alcohol contains water or the alcohol does not contain water and has chosen the possibility favorable to establish obviousness and disregard, without further support, the possibility that the alcohol may have contained water. As such, this argument is based upon

probabilities or possibilities and cannot be utilized to discount the independent claim 18 feature reciting “contacting an alcohol with an adsorbent capable of adsorbing water.”

Even if the statement “[no] water content is the alcohol component is disclosed so the examiner is of the position that water-free alcohols are used” is held to be a proper assertion of inherency, without admitting that such would be proper, the statement does not address the positive step of “contacting an alcohol with an adsorbent capable of adsorbing water” recited in independent claim 18. Lashier provides no indication of how the water-free alcohol was obtained, As such, Lashier does not make clear that the feature of “contacting the alcohol with an adsorbent capable of adsorbing water” is necessarily present and Final Office Action provides no evidentiary support to fill the obvious gap. Consequently, Lashier does not teach the feature of “contacting an alcohol with an adsorbent capable of adsorbing water” and cannot be read to disclose all the elements of the instant claims. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 22 (U.S. 1966).

**VIII. CONCLUSION**

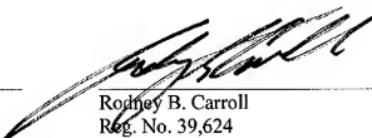
In view of the above arguments, the Appellants respectfully request that the final rejection of the claims be rescinded and the case advanced to issue. Should the Examiner feel that a telephone interview would advance prosecution of the instant application, Appellants invite the Examiner to call the attorneys of record.

The Commissioner is hereby authorized to charge payment of any further fees associated with any of the foregoing papers submitted herewith, or to credit any overpayment thereof, to Deposit Account 50-1515, Conley Rose, P.C. of Texas.

Respectfully submitted,  
CONLEY ROSE, P.C.

Date: 3-12-10

5601 Granite Parkway, #750  
Plano, Texas 75024  
(972) 731-2288  
(972) 731-2289 Facsimile



Rodney B. Carroll  
Reg. No. 39,624

ATTORNEY FOR APPELLANTS

## IX. CLAIMS APPENDIX

1. A process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product comprising the steps of:
  - a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and
  - b) separating the intermediate stream of step (a) into at least one product stream comprising the olefin oligomerization product and at least one heavies stream;  
wherein the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and  
wherein the catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound and wherein the alcohol is added in an amount to effect a mole alcohol to mole aluminum ratio between about 2.5 and about 1.5.
2. (Canceled)
3. The process of claim 1 wherein the reactor effluent stream comprises olefin product(s); an olefin oligomerization catalyst system; an organic diluent; one or more mono-olefins; and polymer.
4. The process of claim 1 wherein the alcohol has a boiling point different from the olefin product in the reactor effluent stream.

5. The process of claim 1 wherein the alcohol has 6 or more carbon atoms per molecule.
6. The process of claim 1 wherein the olefin oligomerization catalyst system comprises a halogenated alkylaluminum compound.

7-9 (Canceled)

10. The process of claim 1 wherein material passed through the reboiler is maintained below about 175°C.
11. The process of claim 1 wherein the alcohol is selected from the group of 1-hexanol, 3-hexanol, 2-ethyl-1-hexanol, 3-octanol, 1-heptanol, 2-heptanol, 3-heptanol, 4-heptanol, 2-methyl-3-heptanol, 1-octanol, 2-octanol, 4-octanol, 7-methyl-2-decanol, 1-decanol, 2-decanol, 3-decanol, 4-decanol, 5-decanol, 2-ethyl-1-decanol, and mixtures thereof.
12. The process of claim 1 wherein the alcohol is selected from the group of diols and polyols.
13. The process of claim 1 wherein the distillation process includes at least two distillation stages.
14. (Canceled).
15. The process of claim 1 further comprising a step of minimizing water content of the alcohol before step (a) by contacting the alcohol with an adsorbent capable of adsorbing water.
16. The process of claim 15 wherein the an adsorbent capable of adsorbing water is selected from the group consisting of alumina, clinoptilolite, zeolite, molecular sieves, sodium-A bauxite, fuller's earth, and acid-activated bentonite.

17. The process of claim 1 wherein the olefin oligomerization product comprises one or more olefin trimers.
18. A process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product comprising the steps of:
  - a) contacting an alcohol with an adsorbent capable of adsorbing water;
  - b) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with the alcohol thereby deactivating the catalyst system; and
  - c) separating the intermediate stream of step (b) into at least one olefin oligomerization product stream and at least one heavies stream;  
wherin the separation comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and  
wherein said catalyst system comprises a chromium source, a pyrrole-containing compound and an alkylaluminum compound and wherein the alcohol is soluble in any portion of the reactor effluent stream.
19. (Canceled)
20. A process according to claim 18 wherein said reactor effluent stream comprises olefin product(s); the olefin oligomerization catalyst system; an organic diluent; one or more mono-olefins; and heavies.

21. A process according to claim 18 wherein the olefin oligomerization catalyst system comprises a halide compound and an alkylaluminum compound.
22. A process according to claim 1 wherein the olefin oligomerization catalyst system comprises a halide compound and a metal alkyl compound.
23. A process according to claim 1 wherein the olefin oligomerization catalyst system comprises a mixture of an alkylaluminum compound and a halogenated alkylaluminum compound.
24. A process according to claim 18 wherein the olefin oligomerization catalyst system comprises a halogenated alkylaluminum compound.
25. A process according to claim 18 wherein the olefin oligomerization catalyst system comprises a mixture of an alkylaluminum compound and a halogenated alkylaluminum compound.
26. The process of claim 6 wherein the halogenated alkylaluminum compound is diethylaluminum chloride.
27. The process of claim 24 wherein the halogenated alkylaluminum compound is diethylaluminum chloride.
28. The process of claim 18 wherein the alcohol has a boiling point different from the olefin product in the reactor effluent stream.
29. The process of claim 18 wherein the alcohol has 6 or more carbon atoms per molecule.
30. The process of claim 18 wherein the alcohol is selected from the group of 1-hexanol, 3-hexanol, 2-ethyl-1-hexanol, 3-octanol, 1-heptanol, 2-heptanol, 3-heptanol, 4-heptanol, 2-

methyl-3-heptanol, 1-octanol, 2-octanol, 4-octanol, 7-methyl-2-decanol, 1-decanol, 2-decanol, 3-decanol, 4-decanol, 5-decanol, 2-ethyl-1-decanol, and mixtures thereof.

31. The process of claim 18 wherein the alcohol is selected from the group of diols and polyols.

32-34 (Canceled)

35. The process of claim 18 wherein material passed through the reboiler is maintained below 175°C.

36. The process of claim 18 wherein the distillation process includes at least two distillation stages.

37. A process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product comprising the steps of:

a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s) and catalyst system with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and

b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream;

wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190°C.

38. (Canceled)

39. The process of claim 37 wherein material passed through the reboiler is maintained below about 175°C.
40. (Canceled)
41. The process of claim 37 wherein the distillation includes at least two distillation stages.
42. The process of claim 37 wherein the reactor effluent stream comprises olefin product(s); the olefin oligomerization catalyst system; an organic diluent; and one or more mono-olefins.
43. The process of claim 37 wherein the alcohol has a boiling point different from the olefin product in the reactor effluent stream.
44. The process of claim 37 wherein the alcohol has 6 or more carbon atoms per molecule.
45. The process of claim 37 wherein the alcohol is selected from the group of 1-hexanol, 3-hexanol, 2-ethyl-1-hexanol, 3-octanol, 1-heptanol, 2-heptanol, 3-heptanol, 4-heptanol, 2-methyl-3-heptanol, 1-octanol, 2-octanol, 4-octanol, 7-methyl-2-decanol, 1-decanol, 2-decanol, 3-decanol, 4-decanol, 5-decanol, 2-ethyl-1-decanol, and mixtures thereof.
46. The process of claim 37 wherein the alcohol is selected from the group of diols and polyols.
47. (Canceled)
48. The process of claim 37 further comprising a step of minimizing water content in the alcohol before step (a) by contacting the alcohol with an adsorbent capable of adsorbing water.
49. The process of claim 48 wherein the an adsorbent capable of adsorbing water is selected from the group consisting of alumina, clinoptilolite, zeolite, molecular sieves, sodium-A bauxite, fuller's earth, and acid-activated bentonite.

50. The process of claim 1 wherein the alkylaluminum compound is a mixture of triethylaluminum and diethyl aluminum chloride, the alcohol is 2-ethyl-1-hexanol, and the olefin product comprises 1-hexene.
51. The process of claim 18 wherein the alkylaluminum compound is a mixture of triethylaluminum and diethyl aluminum chloride, the alcohol is 2-ethyl-1-hexanol, and the olefin product comprises 1-hexene.
52. The process of claim 37 wherein the halide-containing olefin oligomerization catalyst system is a mixture of triethylaluminum and diethyl aluminum chloride, the alcohol is 2-ethyl-1-hexanol, and the olefin product comprises 1-hexene.
53. The process of 18 wherein the olefin oligomerization product stream comprises one or more olefin trimers.
54. The process of 37 wherein the olefin oligomerization product stream comprises one or more olefin trimers.
55. The process of claim 37 wherein the halide-containing olefin oligomerization catalyst system comprises a halogenated alkylaluminum compound.
56. The process of claim 55 wherein the halogenated alkylaluminum compound comprises diethylaluminum chloride.
57. A process to deactivate a halide-containing olefin oligomerization catalyst system and inhibit or limit the decomposition of the deactivated catalyst system during recovery of an olefin oligomerization product comprising the steps of:

- a) forming an intermediate stream by contacting an olefin oligomerization reactor effluent stream which comprises olefin product(s), catalyst system, and heavies with an alcohol that is soluble in any portion of the reactor effluent stream thereby deactivating the catalyst system; and
- b) separating the intermediate stream of step (a) into at least one olefin oligomerization product stream and at least one heavies stream;

wherein the separation of step (b) comprises a distillation comprising a reboiler and material passed through the reboiler is maintained below about 190 °C, and

wherein the catalyst system comprises active metal alkyl units, and

wherinc the alcohol is present in an amount greater than 0.1 and less than about 1.8 equivalents per equivalent of active metal alkyl units.

58. A 1-hexene stream produced by the process of claim 1.

59. A 1-hexene stream produced by the process of claim 17.

60. A 1-hexene stream produced by the process of claim 37.

61. A 1-hexene stream produced by the process of claim 57.

62. A process of claim 1, wherein the separation comprises at least two distillation stages and material passed through each reboiler is maintained below about 190°C.

63. A process of claim 18, wherein the separation comprises at least two distillation stages and material passed through each reboiler is maintained below about 190°C.

64. A process of claim 37, wherein the separation comprises at least two distillation stages and material passed through each reboiler is maintained below about 190°C.
65. A process of claim 57, wherein the separation comprises at least two distillation stages and material passed through each reboiler is maintained below about 190°C.

**X. EVIDENCE APPENDIX**

None

**XI. RELATED PROCEEDINGS APPENDIX**

None